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Geostachys tratensis (*Zingiberaceae*): A New Species from Eastern Thailand

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Geostachys tratensis (*Zingiberaceae*), a new species from eastern Thailand, is described and illustrated. This new taxon is similar to *G. smitinandii* K. Larsen, but differs in its much longer petioles (3–4.5 cm vs. 0.5–1.2 cm), red ligules with acute apices, much longer bracts (2.1–4.5 cm vs.1–1.3 cm), and glabrous involucral bracts. Relationship with its closely related taxa is also discussed.

Key words: *Geostachys tratensis*, new species, Thailand, *Zingiberaceae*.

"Krawan Daeng" (กระวานแดง, literally means red cardamom), a crude drug used in Thai traditional herbal remedies and indigenous drugs, is collected from the areas around the Thai-Cambodian border in Changwats Chantaburi and Trat of eastern Thailand. It was seasonally available in local markets and sold in herbal drug stores in central Bangkok. Presently, it is rare and hardly seen in the market places due to difficulty in accessing the collecting areas that are full of landmines. Taxonomic identity of the plant given this crude drug is, however, unknown. The plant drug was previously identified as a fruit of a presumably red variety of Siam Cardamom or White Cardamom (*Amomum testaceum* Ridl.; syn. *A. krevanh* Pierre ex Gagnep.).

To taxonomically unmask the botanical origin of this crude drug, several field trips in the mountainous areas bordering Thailand and Cambodia, led by locals were made during the past five years. Resulting from these affords, it has clarified that "Krawan Daeng" is a fruit of a unknown species of *Geostachys* Ridl., not of *Amomum* Roxb.

The genus *Geostachys* are all mountainous plants and comprises about 15 taxa (Mabberley 1993), with its center of diversity in Penninsular Malaysia. Six species were currently listed for Thailand, including the most recently described taxon, *G. chayanii* Mayoe (Larsen and Larsen 2006, Mayoe 2010). In this paper, the new taxon, ethnobotanically known in Thailand as the plant source of "Krawan Daeng", is described and illustrated.

Geostachys tratensis Picheans. & Mayoe, sp. nov. [Figs. 1–2]

Type: THAILAND. Changwat Trat, Amphoe Bo Rai, Khao Bantud, 12°22.915′N 102°44.408′E, alt. 732 m, 2 May 2010, C. Picheansoonthon & J. Mayoe 020510-1 (BKF–holotype; BK, SING–isotype).

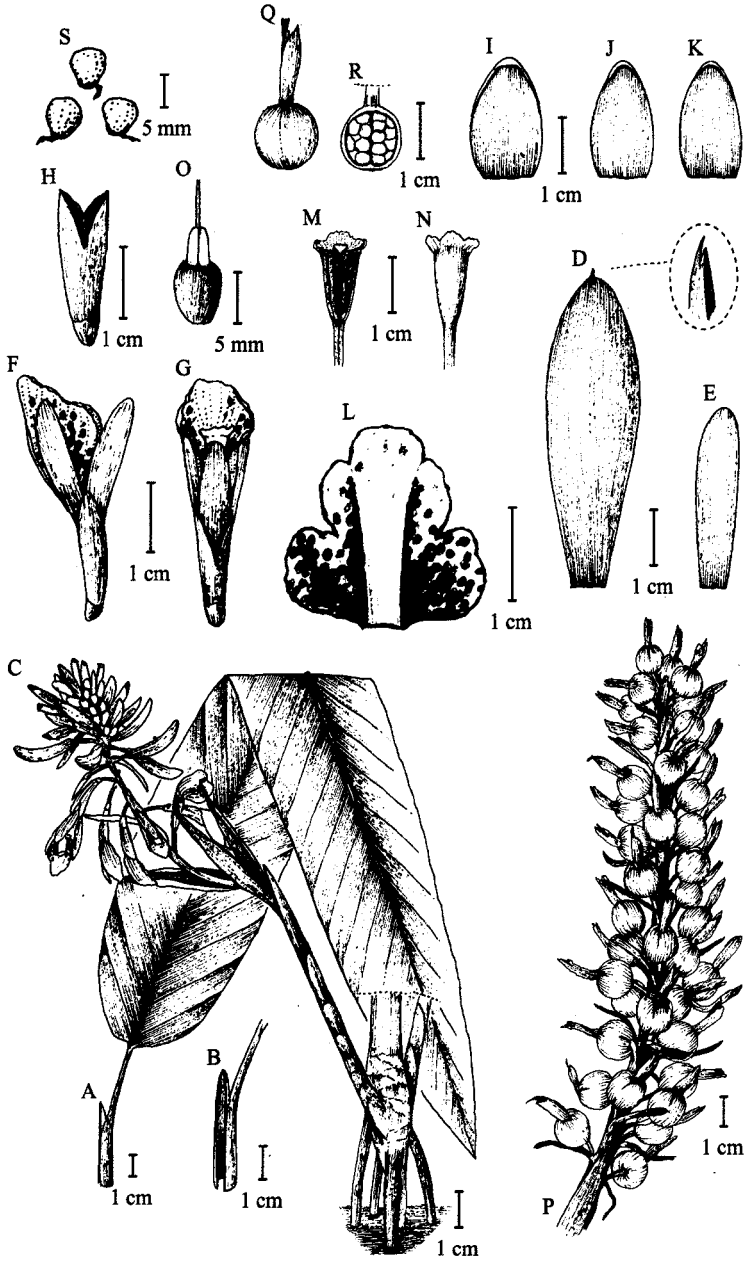

Fig. 1. *Geostachys tratensis* Picheans. & Mayoe. A. Leaf, showing ligule and petiole. B. Lower part of leaf showing ligule and part of petiole. C. Inflorescence showing lower part of pseudostem, rhizome, and stilt roots. D. Involucral bract. E. Bract. F. Flower (side view). G. Flower (front view). H. Ovary and calyx tube. I. Dorsal corolla lobe. J, K. Lateral corolla lobe. L. Labellum. M, N. Anthers, stigma and anther crest (M. front view, N. rear view). O. Ovary, stylodial glands, and lower part of the style. P. infructescence. Q. Fruit (side view). R. Fruit (longitudinal section). S. Seeds. Drawn by C. Boonchit.

Fig. 2. *Geostachys tratensis* Picheans. & Mayoe. A. Plant habit in the type locality. B. Lower part of leaves showing petioles. C. Inflorescences at base of the pseudostem. D, E. Inflorescence. F. Close-up of flower. G. Flower showing bract, pedicel, red ovary, calyx tube, dorsal corolla lobe, labellum and the anther crest. H. Infructescence. I. Close-up of infructescence, showing detail of fruits. Photographed by C. Picheansoonthon.

Table 1. Comparison of some morphological characters of *Geostachys smitinandii* K. Larsen and *G. tratensis* Picheans. & Mayoe

	G. smitinandii	*G. tratensis*
Leaf		
Shape	lanceolate	oblong
Surface	upper surface glabrous, lower surface hairy	both sides glabrous
Petiole	0.5–1.2 cm long	3–4.5 cm long
Ligule	4–7 × 5–6 mm, bilobed, apex bilobed, hairy, greenish	8–10 × 7–8 mm, apex acute, glabrous, red
Inflorescence		
Involucral bract	hairy	glabrous
Bract	lanceolate, 1–1.3 × 0.4–0.6 cm, white	lanceolate to oblong, 2.1–4.5 × 0.8–1.1 cm, white to pinkish white

Geostachide smitinandii similis, petiolis longioribus (3–4.5 cm contra 0.5–1.2 cm), ligulis rubris apicibus acutis, foliis infra glabris, bracteis longioribus (2.1–4.5 cm contra 1–1.3 cm), involucrorum bracteis glabris differt.

Perennial herb. Pseudostems to 3 m high, leaf sheaths reddish, bladeless sheaths 2–4. Ligule oblong, 0.8–1 cm × 7–8 mm, apex acute, glabrous, red. Leaves petiolate, petioles 3–4.5 cm long, red; blade oblong, 32.9–49.7 × 7–8.7 cm, base oblique to round, apex acute to acuminate, margin entire or slightly undulate, both surfaces glabrous. Inflorescences 2–5 at base of the pseudostem, erect or slightly drooping, 10.4–21.4 cm long; peduncle 4.7–17 cm long, glabrous, lower part of the axis without flower, covered with involucral bracts; involucral bracts 9–18, the upper most one the largest, obovate to oblong, 7.3–10 × 1.7–2.7 cm, apex acute or mucronate, pinkish red, glabrous; bract lanceolate to oblong, 2.1–4.5 × 0.8–1.1 cm, apex acute, glabrous, white to pinkish white; cincinnae uniflorous spreading evenly on all sides. Flowers white with red-spotted; calyx tubular, 1.4–1.6 cm × 4–6 mm, apex 2-dentate, split one side, whitish; corolla tube slightly shorter than calyx tube, 1.2–1.4 cm × ca. 3 mm, 3-lobed, lobes linear, apex hooded, white, 1.5–2.1 cm × 5–8 mm; labellum spreading, triangular, whitish with red-spotted at base and along the margin, 3.1–3.6 × 2–2.5 cm, pubescent; filament red, 0.7–1.2 cm long, pubescent; anther dorsifixed, opening by longitudinal slits, 0.9–1.2 cm × 3–5 mm; ovary oblong or globose, 3–5 × 2–5 mm, 3-loculed, placentation axile, glabrous; epigynous glands 2, surrounding style, ca. 2 × 2 mm, yellowish; stigma red, densely ciliate. Fruits orbicular, 1.2–1.7 × 1.2–1.9 cm, glabrous, light pink in young and reddish when mature, pedicel 0.6–1.7 cm long, calyx persistent, 1.4–1.9 cm × 3–4 mm. Seeds 5–11 in locule, ovate to oblong, ca. 5 × 3–4 mm, white.

Other materials studied: THAILAND. Near type locality, 12°23.091′N 102°44.425′E, alt. 748 m, 23 May 2009, Picheansoonthon & Mayoe 230509-1 (BK, BKF, SING).

Phenology: Flowering from end of March to early May; fruiting from April to June.

Distribution: This new species is so far known from the type locality, Khao Buntad-Khao Kuap (Thailand, Changwat Trat) in the mountain range bordering Thailand and Cambodia.

Ecology: It grows in disturbed forest at the altitude 730–780 m. The type location may previously have been moist evergreen forest, but the area was heavily deforested, following repeated annual forest fire. The type area is

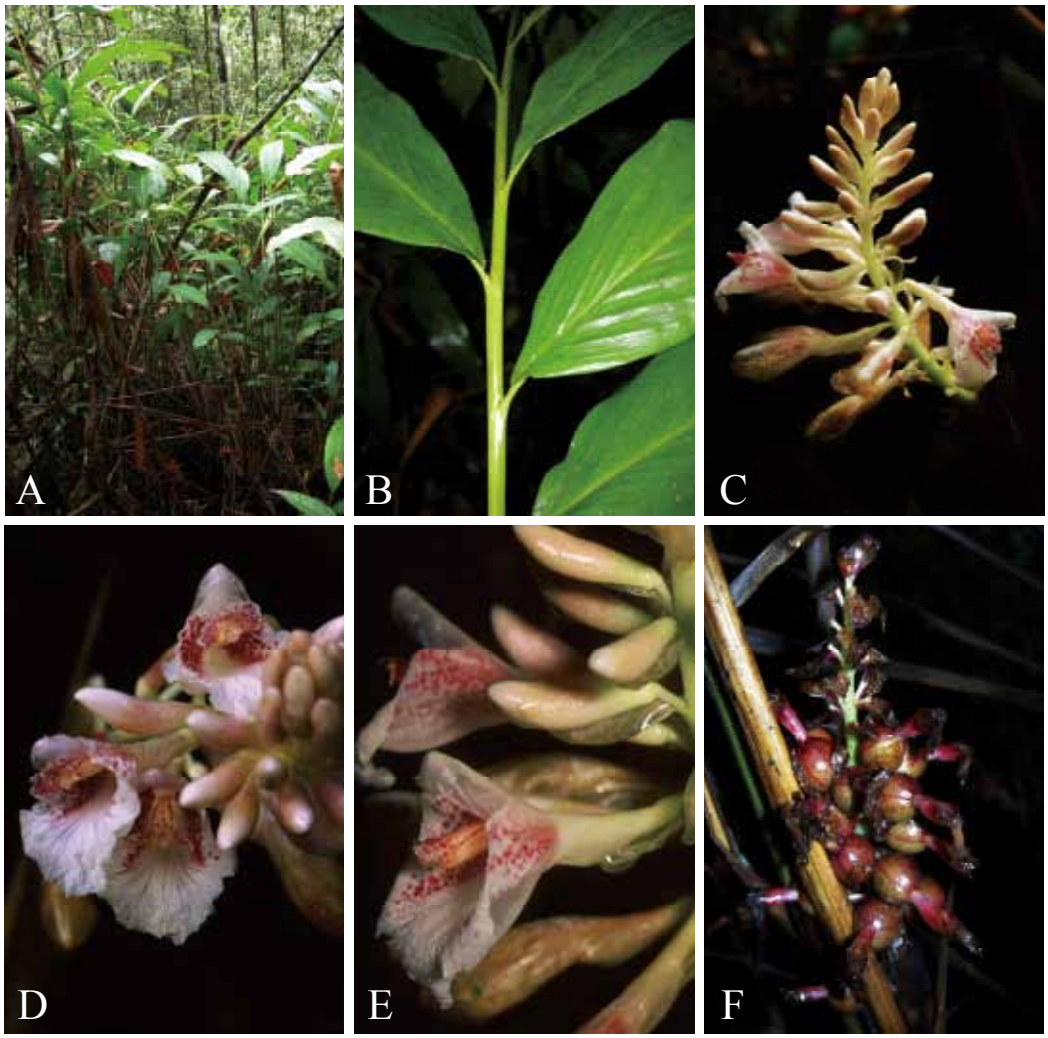

Fig. 3. *Geostachys smitinandii* K. Larsen. A. The plants habit, in its type location. B. Lower part of the leaves showing short petioles. C. An inflorescences at base of the pseudostem. D, E. Close-up of flowers. F. An infructescence. Photographed by C. Picheansoonthon.

near the Thailand-Cambodia border, previously a military camp of the former Khmer Rouge, and still full of landmines.

Vernacular name: Krawan Daeng (กระวานแดง).

Uses: Medicinal.

Note: This new taxon is closely related to *G. smitinandii* K. Larsen (Larsen 2001; Fig. 3). Both species are similar in the general plant habit, the inflorescence, the pink-colored flowers with reddish spots and the reddish brown fruits. It can, however, be easily distinguished from the latter taxon by its long petioles (3–4.5 cm long in *G. tratensis*, 0.5–1.2 cm long in *G. simitinandii*) and much longer bracts (2.1– 4.5 cm long in *G. tratensis*, 1–1.3 cm long in *G. simitinandii*). Also, the lower leaf surface and the involucral bracts of this new species are glabrous, while those of *G. smitinandii* are hairy. Comparison of some morphological charaters of both taxa is shown in Table 1.

The Thai *Geostachys* can be classified into

two groups according to the color of the flowers: the yellow-flowered group and the whitish-pinkish-flowered group. Currently the first group (with 5 species) are known to be distributed in peninsular Thailand, whereas the latter group (with 2 taxa) are found in central-eastern Thailand. This new species, with *G. smitinadii*, belongs to the whitish-pinkish-flowered group.

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C. Picheansoonthon[a, b], J. Mayoe[b]：**タイ東部産ショウガ科植物の1新種，*Geostachys tratensis***

タイ東部からショウガ科植物の1新種，*Geostachys tratensis* Picheans. & Mayoe を記載した．本種は *G. smitinandii* K. Larsen に似るが，葉柄がより長く，葉舌の先端が鋭形で赤みを帯び，苞がより長く，総苞が無毛である点で異なる．基準産地はタイとカンボジアの国境地帯の近傍で，これ以外の産地は知られていない．

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